

Princeton (1110)

Introduction

This municipal chapter is an element of the Mercer County Wastewater Management Plan prepared by the Mercer County Planning Division in accordance with N.J.A.C. 7:15.

Princeton is located in the north eastern portion of Mercer County and encompasses approximately 17 square miles. Princeton is suburban with small areas of contiguous rural landscape surrounding a densely developed downtown. In 2013, this area, previously a self-governing New Jersey municipality and known as Princeton Borough, was merged with Princeton Township. This merger resulted in a self-governing municipality now known as Princeton. See the new Princeton municipal boundary on Map 1 - Jurisdictional Boundaries in the County Summary.

The downtown area is densely populated with a variety of housing, commercial uses, and large educational campuses. The Princeton Theological Seminary, Princeton University, Westminster Choir College-Rider University, and Princeton High School campuses together comprise over 25 percent of the land that was once the Borough. In addition to its internationally known educational campuses, the character of the downtown area is defined by its historic structures and cultural resources. Route 27 is the main street which contains a mix of shops, restaurants, and housing across from the Princeton University Campus.

Both suburban and rural lands are intersected by a network of streams that make their way through to other municipalities and define the southeastern and eastern borders of Princeton. The major streams on the western side of Princeton are bordered by preserved open space. Approximately 3 percent of Princeton's land, in the southeastern corner, is located in the agriculture development area and is eligible for farmland preservation programs. In addition, approximately 16 percent of Princeton is comprised of public parks and preserved open space. These areas include municipal and regional parks, and natural and cultural areas. The remaining land within Princeton consists mainly of residential housing and educational campuses. A mix of residential housing is found throughout Princeton with the densest housing found within the downtown area. Routes 206 and 27, located in the center of Princeton, are the major north-south transportation corridors.

The 2007 DVRPC population projection estimates Princeton Township's 2010 population to be 17,200 and Princeton Borough's population to be 13,942. The US Census estimates the Princeton Township's 2010 population to be 16,265 and Borough of Princeton's 2010 population to be 12,307. The total 2010 Princeton population according to the 2007 DVRPC population statistics is 31,142.

Following are some important considerations for this municipality with respect to wastewater management planning:

- Princeton is considered a non-urban municipality.

In this document the following terms are used frequently:

EDUs - Equivalent Dwelling Units - a measure where one unit is equivalent to wastewater effluent from one dwelling unit. NJDEP defines a dwelling unit to mean any building or portion of a building, permanent or temporary, used or proposed to be used as a residence either seasonally or throughout the year. Most often, EDU is used in reference to a single family home.

gpd – gallons per day, a unit of flow measurement.

GW – groundwater

HUC11 - Hydrologic Unit Code consisting of 11 digits – a United States Geological Survey (USGS) standard designation for subwatersheds delineated based on topography.

Individual Subsurface Disposal System (ISSDS) – means a system for the disposal of sanitary sewage into the ground, which is designed and constructed to treat sanitary sewage in a manner that will retain most of the settleable solids in a septic tank and discharge the liquid effluent to a disposal field.

mgd – million gallons per day, a unit of flow measurement.

Nitrate Dilution Model (NDM) –The NDM is required by NJDEP and follows the calculations methodology developed by the New Jersey Geological Service (NJGS). The NDM uses the soils type (SSURGO (NRCS) digital soils GIS layer revised by DEP) to estimate the minimum lot size needed to provide enough recharge to dilute nitrate to a specified target. This method is intended to be a guide for estimating the impact of nitrate from septic tanks on groundwater quality. The NDM uses the minimum lot size to calculate the number of EDUs possible for a given area.

Non-discharge areas - areas where additional wastewater generation and/or discharge are prohibited.

Non-urban municipality – any municipality not officially designated as an urban municipality

Septic Area – means an area to be served by systems for the disposal of sanitary sewage into the ground, which is designed and constructed to treat sanitary sewage in a manner that will retain most of the settleable solids in a septic tank and discharge the liquid effluent to a disposal field. Planning flows for septic areas are 2,000 gpd or less.

Service Areas – areas designated as wastewater discharge to permitted surface water facilities, groundwater facilities, ISSDS, or septic

Sewer Service Area (SSA) – represents the area to be served by a centralized treatment facility.

STP – Sewage Treatment Plant

SW – surface water

Undeveloped/under developed – areas within the existing or future sewer service area that could be developed

WMP – Wastewater Management Plan

WPCF – Water Pollution Control Facility

WPCP – Water Pollution Control Plant

WTF – Water Treatment Facility

WWTP – Wastewater Treatment Plant

Existing Infrastructure

The existing wastewater collection and conveyance infrastructure within this municipality consists of the following:

- Collection System – Princeton is largely developed while the northeast and southwest corners retain rural and natural features amongst developed lands. The collection system and associated trunk sewers convey flow from the populated areas within Princeton to the SBRSA River Road STP.
- Pumping Stations – There are currently nine (9) pumping stations within the municipal limits.

The existing major wastewater treatment facilities located within the municipality include:

- SBRSA River Road STP – the wastewater treatment facility serving the municipality.

The four member Sewer Operating Committee plans, develops, and operates the Princeton municipal sanitary sewer collection system and River Road Convenience Center.

The Committee reviews development applications to calculate anticipated wastewater flow and possible sewer trust fund payment prior to issuance of building permits. In addition the Committee issues sewer connection permits after review of application for compliance with “Rules and Regulations for House Connections and Sewer Extensions” for all installations and repairs of sewer laterals.

In addition to the major wastewater treatment facility, Tables 1a and 1b include additional minor facilities in Princeton regulated through NJDEP that have individual New Jersey Pollutant Discharge Elimination System (NJPDES) discharge permits. Table 1a shows facilities which are indicated as discharge to groundwater (DGW). Table 1b shows facilities which are indicated as discharge to surface water (DSW).

The NJDEP, Division of Land Use Management, provided the data for Tables 1a and 1b.

The existing treatment facilities if any, are illustrated on Map 2M.

Table 1a: Additional NJPDES (DGW) Minor Permitted Facilities within Princeton

NJPDES Permit Number	Facility Name	Permit Program Code	Receiving Stream or Aquifer	Classification	Permittee	Contact Organization Name	Block	Lot	Permitted Flow (MGD)	Existing Flow (MGD)	Future Flow (MGD)	Discharge Category
NONE												

Table 1b: NJPDES (DSW) Permitted Facilities within Princeton

NJPDES Permit Number	Facility Name	Permit Program Code	Receiving Stream or Aquifer	Classification	Permittee	Contact Organization Name	Block	Lot	Permitted Flow (MGD)	Existing Flow (MGD)	Future Flow (MGD)	Discharge Category
NJ0031119	SBRSA River Road STP	SW	Delaware River Zone 2	FW2-NT	Stony Brook Regional Sewerage Authority	John Kantorek	1503	6	13.060	11.710	18.294	Sanitary

Environmental Features

Princeton is bordered by Hopewell Township, Lawrence Township, and West Windsor Township and is bisected by US Route 206. The Millstone River, Carnegie Lake, and the Delaware and Raritan Canal border Princeton on its northeastern and eastern sides. The municipality contains protected open space and recreational areas including but not limited to the following:

- Autumn Hill Reservation
- Barbara Smoyer Memorial
- Community Park North/South
- Grover Park
- Harrison Street Park
- Hilltop Park
- Marquand Park
- Mary Moss Park
- Mountain Lakes Nature Preserve
- Pine Street Park
- Potts Park
- Quarry Park
- Smythe Woods
- Van Dyke Wight Woods
- Witherspoon Woods
- Woodfield Reservation

There are approximately 305 acres in the Princeton Agriculture Development Area (ADA). Farmland within the ADA is generally privately owned with publicly-held easements. A specific listing of these farms can be found in the Mercer County Farmland Preservation Plan.

Several small streams including Mountain Brook, Stony Brook, Harrys Brook, and Alexander Creek flow from the north to the south within the municipality. Carnegie Lake runs through the southern side of Princeton on the border with West Windsor Township. Carnegie Lake discharges into the Delaware and Raritan Canal which borders the southern boundary of the municipality.

Delineation of Service Areas and Planning Integration

Sewer Service Areas

Following are the sewer service areas within Princeton. Existing areas served and future SSAs are shown on Maps 2M and 3M, respectively. The facilities providing treatment to these service areas have an associated facilities table in the Appendix.

- SBRSA River Road (NJPDES NJ0031119) – This SSA encompasses nearly the entire municipality.

An explanation of the mapping method used to delineate the SSA is included in Appendix A to this chapter.

Septic Areas (ISSDS)

Individual subsurface sewage disposal systems (ISSDSs) consist of those areas with planning flows 2,000 gallons per day or less (i.e. residential septic systems) that are neither designated for sewer service nor as non-discharge areas. These areas can be seen in Maps 2M and 3M.

Future Wastewater Demand and Facilities

For the purposes of evaluating capacity and future sanitary flow rates, the full build-out of undeveloped or underdeveloped land in the township was derived from existing zoning and the development potential of land parcels within the municipality. The results of the build-out were compared to the permitted treatment capacity of major wastewater treatment facilities. This analysis is not required for the minor facilities.

The County used CommunityViz, a land use planning software package offered through Placeways, LLC. CommunityViz is an extension for ESRI's ArcGIS platform that uses existing zoning information to estimate future development. CommunityViz uses zoning data such as minimum lot size and set back requirements to evaluate potential number of future residential units or square feet of commercial space on individual parcels or within the municipality.

The County has identified a category of service indicated as "open with facilities". This category was created in response to a number of comments received from municipalities to include recreational lands, many purchased through public funding, in the Future SSA. The requests pertain to open space properties that currently have support facilities or may have them in the future. The intent of this service type category is to account for up to 2,000 gpd of wastewater generation from these parcels, while recognizing they will continue to function as municipal open space and recreational facilities. The estimated flow has been included in the capacity analysis for the facility serving the closest sewer service area. This category gives municipalities flexibility in planning for essential facilities that support existing and future recreational programming at the local level.

Sewer Service Area Wastewater Capacity Analysis

Table 2a presents the results of the Build-out Analysis within the SSA indicated above.

Table 2a: Princeton Build-out Table (SSAs)

NJPDES Permit Number	Major Public Wastewater Treatment Facility	Capacity Allocation/ Permitted Capacity (mgd)	Total Existing Flow (mgd)**	Total Flow Attributed to TWAs Approved But Unconnected (mgd)	Residential Build-out Flow (mgd)	Non-Residential Build-out Flow (mgd)	Existing Septic Systems Flow (mgd)	Total Projected Build-out Flow (mgd)	Remaining Capacity (mgd)
				Committed Flow (mgd)					
NJ0031119	SBRSA River Road STP	13.060/FCF S*/Mbr	4.280	0.115	0.591	0.318	N/A	5.304	See facility table
				4.395					

*See SBRSA facility table for current and build-out flows by municipality. FCFS=First Come First Served; Mbr=SBRSA Member.

**Total Existing Flow is taken from DMR data February 2011 through January 2012.

Treatment Works Approvals (TWAs) approved by NJDEP for unconnected projects within Princeton Township and Princeton Borough consist of the following:

Table 2b – Treatment Works Approvals – Princeton Township

TWA	Municipality	Facility	Unconnected Flow (mgd)
RushBrook Phase II	Princeton Township	SBRSA River Road STP	0.0003
Copperwood/Hilltop at Princeton	Princeton Township	SBRSA River Road STP	0.0251
Gordon Bunn Drive MAB Assoc	Princeton Township	SBRSA River Road STP	0.0031
Princeton University New Chemistry Bldg	Princeton Township	SBRSA River Road STP	0.0190
Tenacre Foundation	Princeton Township	SBRSA River Road STP	0.0053
Gallup Road Sewer Extension	Princeton Township	SBRSA River Road STP	0.0006
Institute for Advanced Study Short Term Academic Housing	Princeton Township	SBRSA River Road STP	0.0031
Westerly Road Church	Princeton Township	SBRSA River Road STP	0.0038
Princeton U Neuroscience & Psychology Building	Princeton Township	SBRSA River Road STP	0.0214
Palmer Square North (Hulfish North)	Princeton Borough	SBRSA River Road STP	0.0191
Princeton Redevelopment Building C (mixed use)	Princeton Borough	SBRSA River Road STP	0.0118
Humbert St. Reconstruction	Princeton Borough	SBRSA River Road STP	0.0000
Nassau Inn Expansion	Princeton Borough	SBRSA River Road STP	0.0021
Total			0.1147

The capacity of SBRSA River Road STP is shown in the Facility Table. The facility has no formal agreements with regard to allocation of treatment capacity.

With regard to the SBRSA facility, flows are accepted on a first-come-first-served basis from the participant member communities. Princeton is a participant member of the SBRSA.

Undeveloped and underdeveloped parcels are shown on Map 3M.

Septic Area Wastewater Capacity Analysis

Table 3 presents the results of the Build-out Analysis within the ISSDS. The ISSDS is shown on Map 3M.

The breakdown by HUC11 subwatershed is shown below.

Table 3 –Princeton Build-out by HUC11

HUC11	Build-out Potential (Equivalent Dwelling Units)		Surplus/Deficit
	Using Nitrate Dilution Model	Under Municipal Zoning	
02030105090	374.6	5.00	369.6
02030105110	123.1	0.00	123.1

Table 3 shows the variation in build-out results based on existing zoning as compared to the potential EDUs predicted by the Nitrate Dilution Model (NDM). The zoning based build-out and the NDM should be run on a HUC11 basis to determine if the entire HUC11 has sufficient nitrate dilution capacity to accommodate full zoning build-out.

For Table 3, equivalent dwelling units were calculated using the following formula: [potential residential flow (gpd) + potential non-residential flow (gpd)]/500 gpd/EDU. Potential non-residential flow in septic areas was estimated using existing zoning criteria (e.g. FAR) and a flow factor of 0.125 gpd/square foot.

The Septic Area (i.e., septic) build-out capacity analysis for Princeton was based on the 2.0 mg/L statewide standard for the target concentration of nitrate in groundwater.

Following are the results of this analysis shown in table 3 for Princeton's portion of the HUC11:

- For HUC11s 02030105110, no ISSDS parcels were present in the HUC11. So, the Build-out Potential Under Municipal Zoning was zero. However, the Nitrate Dilution Model (NDM) was used to calculate the surplus dilutive capacity of parcels such as open space and environmentally sensitive areas that were not hydric. The calculated surplus can be used to offset deficits within the municipality and within this HUC11 on a regional basis.
- For all HUC11s, the build-out results based on existing zoning are less than the number of potential EDUs generated by the NDM for septic capacity, and therefore, no further analysis of these HUC11s will be required nor will any change in zoning be required.

A list of zoning codes and descriptions are included on Map 4M.

Appendix A – Basis for Service Area Delineations

SSA (Sewer Service Area)

The SSA designation is for areas from which wastewater is designated to flow to a permitted wastewater treatment facility.

In assigning the SSA designations shown, several data sources were considered:

- Cross-Acceptance proceedings (2004)
- NJDEP's adopted SSA map for Mercer County (2006)
- NJDEP's draft SSA map for Mercer County (2008) including revised editions based on public comments received from December 2008 through March 2011; editions of the original 2008 map were reviewed periodically during this period once in June 2009, once in February 2010, and once in November 2010 prior to the NJDEP Public Meeting in December 2010.
- Data (such as collection system extent) obtained from municipalities or private entities.
- Existing TWA permits
- Sewer service areas provided by existing sewerage authorities and wastewater treatment facilities

Parcels that were within previous draft or adopted sewer service areas, or existing sewer service areas provided by sewerage authorities or wastewater facilities, were given the SSA designation, unless specific guidance was provided to remove them. In early 2010, the NJDEP issued Administrative Consent Order 2010-03. Subsequent to adoption of the ACO, all mapping followed the protocol established in the ACO.

Proximity to existing collection system was considered if service for a given parcel was indeterminate based on other criteria.

Parcels with valid NJDEP Treatment Works Approvals (TWA) were automatically given an SSA designation.

Septic Areas (ISSDS)

The ISSDS designation represents those areas served by septic systems. For the purpose of mapping, the ISSDS designation also represents those areas that are not designated as any of the other categories (SSA or Open/Utility as described below).

Open & Utility (Open Space, Open with Facilities, Utility)

The Open & Utility designation identifies the following:

- Open Space – Mercer County Planning Division maintains an open space layer. The county boundary is the layer's geographic extent. The open space layer is developed from several sources including a county-owned land inventory, Green Acres ROSI, preserved farmland inventory, municipal open space inventories, and state and non-profit open space inventories. The open space layer served as the basis for identifying undevelopable land designated through the Plan as Municipal, County, or State Land, Deed Restricted properties, Conservation Easements, and certain lands overseen by non-profit entities.

- Open with Facilities - This category was created in response to comments received from municipalities to include recreational lands in the Future SSA. These open space properties currently have support facilities or may have them in the future. This category gives municipalities flexibility in planning for essential facilities that support existing and future recreational programming at the local level.
- Utility - tax assessment data was used to identify lands owned by public utilities.

This designation indicates that these parcels are undevelopable, except for instances where public programs require the construction of public facilities.

Environmentally Sensitive Areas

The Environmentally Sensitive Areas (ESAs) designation applies to those areas that have been mapped as such by NJDEP. They consist of the following:

- Wetlands – areas based on NJDEP’s Land Use/Land Cover feature class (2002)
- Stream corridors – areas which incorporate the appropriate buffer along surface waters based on NJDEP’s stream classification (2008)
- Natural Heritage Priority Sites – areas of critical importance due to the presence of rare plant species and ecological communities (2007)
- Landscape Project Areas (Rank 3, 4, and 5) – areas representing wildlife habitat mapping for community planning and endangered species conservation. Rank 3 is associated with NJ State threatened species. Rank 4 is associated with NJ State endangered species. Rank 5 is associated with Federal threatened or endangered species (2007)

Methodology

The following methodology was employed to designate all parcels within Mercer County as either SSA or ISSDS, except for parcels designated as Open/Open with Facilities/Utility as described above. The following is the general methodology used for preparing the Draft SSA Map.

1. Parcels were evaluated to determine if:
 - a. It was designated under the Mercer County’s open space inventory.
 - b. It was owned by a public utility.Any parcels falling within the above categories were designated as Open/Utility.
2. The remaining parcels were evaluated to determine if they were part of previous approved SSA. If so, these parcels were designated SSA, unless directed otherwise by NJDEP, Mercer County, or the Municipality.
3. The remaining parcels not designated as previously part of an SSA were also evaluated to determine if any existing wastewater generating structures were present onsite using Mercer County’s building footprint (January 2009) layer and aerial photography (2007). County staff further reviewed these parcels with more current aerial photography (2009). COAH and local approvals were also considered in this evaluation. If sewage generating potential was identified, the parcel was further evaluated to determine if it was readily

sewerable by an existing collection system without extending it. If this was the case, the parcel was designated as SSA unless:

- a. A significant portion of the parcel is undeveloped and falls within the constrained boundary AND
- b. Comments were received from NJDEP indicating the constrained portion of the parcel was to be excluded from the SSA.

In cases where a) and b) above apply, the parcel was split along the Constrained boundary. In this case, the portion of the parcel within the Constrained boundary was designated ISSDS and the remaining unconstrained portion was designated SSA.

4. For parcels not addressed under 1, 2, or 3 above, any vacant lands were evaluated to determine if it was readily sewerable by an existing collection system without extending it. If this was the case, the parcel was designated as SSA unless:
 - a. Comments were received from NJDEP, Mercer County, or the Municipality indicating the subject parcel should be excluded from SSA category. If such was the case, the parcel was designated ISSDS.
 - b. The parcel was constrained in whole or in part by Environmentally Sensitive Areas (ESA). If this was the case, the portion of the parcel within the constrained boundary was designated as ISSDS and the remaining unconstrained portion was designated as SSA.
5. Parcels that were not designated under 1, 2, 3, or 4 above were designated as ISSDS.